EFFECTS OF SMALL WATERSHED DEVELOPMENT ON LAND VALUES

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U.S. Department of Agriculture
Economics, Statistics, and Cooperatives Service

Agricultural Economic Report No. 404

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ABSTRACT

Small watershed flood control development (Public Law 566) has had varying impacts on structure site land values. Economics, location, climate, and land use differences were found to be important factors in assessing land value changes. Oklahoma and Nebraska data indicate that onsite land value changes due to the program range from a negative 37.75 percent to a positive 24.2 percent, depending on estimating and deflating procedures. Data also indicate that easement expenditures for flood control structure sites usually exceed the 25 to 38 percent compensation necessary to leave landowners in the same financial position before and after the transfer of land rights.

Key Words: Land Value, Small Watershed Program, Easements, Land Rights, Land Enhancement, Reservoir Value, Evaluation, Realtor Estimates, Regression Analysis.

ACKNOWLEDGMENTS

This research project was funded by the Soil Conservation Service (SCS) through transfer of watershed funds to the Economic Research Service (as of January 1978, the Economics, Statistics, and Cooperatives Service). The cooperation and assistance of SCS, particularly of members of the Watershed Planning Division, are greatly appreciated.

The contribution of Stephen S. Cramer and Ann Laing, Research Assistants, Department of Economics, Colorado State University, in assembling, keypunching, and analyzing the data is also acknowledged.

The Oklahoma Conservation Commission and the Nebraska Natural Resources Commission provided land purchase, land sale, and easement cost data. Particularly helpful were Leonard A. Solomon, Executive Director of the Oklahoma Conservation Commission, and Gayle Stair, Administrative Officer of the Nebraska Natural Resources Commission.

The cooperation and help of realtors, land appraisers, county clerks, assessors, and district and State Soil Conservation Service personnel and others are greatly appreciated.

Washington, D.C. 20250 May 1978

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HIGHLIGHTS

Local realtors and land appraisers in the Great Plains estimate the Small Watershed Program (Public Law 566) to have a modest impact in terms of increased land values. Generally, these estimates were below 10 percent of current land values, and were qualified by local economic, locational, climatic, and use differences. For example, in the more limited rainfall areas of the Great Plains, increases in land values resulting from the program were estimated to be minimal because dry structures provide little aesthetic enhancement. Multiple ownership of land surrounding reservoirs was considered to lower land values, because ownership conflicts and access control problems reduce the desirability of multiple ownership sites.

Actual sale data from Oklahoma and Nebraska indicate that small watershed development has a mixed impact on structure site land values. Estimates of land value change range from a decrease of 27.5 percent with deflated price data to an increase of 24.2 percent with nondeflated price data. Actual sale data also indicate that in order to leave the landowner in the same financial position before and after the taking of land rights for watershed development, easements should not be valued at more than about 25 percent of total land value.

Regression analysis of Oklahoma and Nebraska data indicates that the value of structure site lands depends on land use and locational factors plus personal income and time. Oklahoma data also indicate that watershed construction is a significant factor in explaining land value differences. This analysis shows that watershed construction decreased land values by $69.53 per acre, or by approximately 38 percent of the mean value of the last transaction price. Thus, if landowners are to be left in the same pecuniary position after taking land rights, easements should not be valued at more than about 38 percent of average land values.

Examination of Nebraska data shows that easement costs for small watershed development averaged 55 percent of land purchase costs during 1967-75. Realtor estimates of easement costs in other Great Plains States ranged from 75 to 90 percent of direct land purchase costs.

With evidence of onsite land value declines due to watershed construction and an overvaluation of easement costs, it would appear reasonable that some evaluation policies and procedures may need to be carefully examined and possibly revised. It is hoped that the Water Resources Council's multiobjective evaluation procedures will recognize the influence of structure sites on land values and on the value of easements.

The results of this study are based on findings in the Great Plains States. Unique regional characteristics, both physical and economic, should be analyzed before generalizing the results of this study to other regions of the United States.

EFFECTS OF SMALL WATERSHED DEVELOPMENT ON LAND VALUES

by James Kasal 1/

INTRODUCTION

The close theoretical relationship between land values and expected future earnings implies that any resource development that changes expected earnings will affect land values. Since investments through the Small Watershed Program (Public Law 566) result in resource development, it follows that expected earnings and land values will likely be affected. However, because investments in flood control structures are frequently made at one place for the benefit of other locations, the theoretical linkage between investments and land values may become unclear or broken. This study attempts to establish and clarify the relationship between small watershed development investments and land values at structure sites.

The Small Watershed Program provides Federal technical and financial aid to local organizations to carry out projects for control of flooding, erosion, and sedimentation; agricultural water management; recreation and fish and wildlife development; and municipal and industrial water supply. The program applies to watersheds of 250,000 acres and less, and is administered by the U.S. Department of Agriculture's Soil Conservation Service (SCS) under Public Law 83-566.

Since its implementation in 1954, the Small Watershed Program has emphasized flood protection to agricultural land, although other purposes have been added or expanded. The impacts of this program and the benefits to downstream activities and land values have been recognized and documented. However, the impacts of the program at the structure sites are not well known. As a result, computation of program benefits has been based on flood protection and changed downstream productivity and use. Few benefits have been directly attributed to the structure sites themselves unless evidence of recreation, irrigation, or municipal and industrial water use could be documented.

There is a need to know if the program has a positive or negative impact at structure sites in order to determine what policy and evaluation techniques should be used by program agencies. The magnitude of these impacts also has a direct and important effect on how development costs are allocated between Federal and local sponsors. Changes in structure site land values resulting from program impacts are significantly related to the real costs of land

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easements. Therefore, knowledge concerning program impacts at structure sites could have a significant influence on project evaluation, how these evaluations relate to project approval, and how funding is divided between Federal and local sources.

Objectives and Procedures

This study attempts to determine the effects of small watershed resource development on land values. Specifically, the study (1) estimates net land value changes in the immediate vicinity of small watershed reservoirs; (2) analyzes the major factors affecting the magnitude of land value changes; and (3) estimates the real cost of land easements.

Because of the problems and costs involved in collecting primary land value data that an analysis of all factors affecting land values would entail, other approaches and secondary data were used. Perceived land value changes by local realtors, land appraisers, tax assessors, and others knowledgeable about local conditions are used as one estimate of the impact of the Small Watershed Program on land values. Another estimate of the impact was made with actual land purchase and sale data from Nebraska and Oklahoma. 2/ The perceived estimates are then compared with the estimates made from the Nebraska and Oklahoma data. Multiple regression analysis was used to further identify those factors which affect structure site land values. 3/

THEORETICAL CONSIDERATIONS

The use of land values as a measure of the benefits of resource development is not new. Traditional economic theory says that land values are normally determined by expected future earnings from the land. Measuring benefits through changes in land values has a compelling simplicity and has been widely accepted. The use of this technique is based on the theory of economic rent, which postulates that the value of a fixed resource is determined by its expected future earnings.

Economic rent is a specialized concept used by economists and defined as "the surplus of income above the minimum supply price it takes to bring a factor into production." 4/ Economic rent is traditionally used with reference

2/ Nebraska and Oklahoma, through State revolving funds, buy and sell land for the purpose of facilitating small watershed development. Data on the purchase of land before construction and the sale of land after construction were available. Administrators of funds in both States are of the opinion that the data may be somewhat biased because these State funds are usually used in problem situations.

3/ Two other approaches were attempted to further verify estimates of the impact of watershed projects on land values. One approach used planned project benefits, while the other used easement costs, to estimate possible land value increases resulting from watershed development. Neither of these approaches led to satisfactory estimates of land values at structure sites.

4/ Raleigh Barlow, Land Resource Economics, Prentice Hall, Inc., Englewood Cliffs, N.J., 4th Printing, 1963, p. 150.

to land in contrast to other factors of production (labor and capital). The distribution of earnings among factors of production depends on the price-quantity relationship for both inputs and outputs, as well as on the other employment alternatives for the factors.

Traditionally, it has been assumed that because the supply of land is fixed and lacks mobility, it can command only the residual value of its product after other factors have claimed their shares. The residual value--economic rent, or expected future earnings--is then used to calculate the real or market value of land. This market value is determined by capitalizing the economic rent or expected future earnings at an appropriate interest rate.

Because of the close theoretical relationship between land values and expected future earnings, it follows that any resource development that changes the net returns expected from land will have a direct effect on the market value of that land. Resource development is generally considered a basic value-enhancing activity, because in order for investment to take place the development must be potentially productive either in the present (short run) or in the future (long run).

To the extent that land markets operate effectively, resource development should lead to increased land values. Lind shows that the rental value of land equals the net productivity of a land-based activity and that benefits from investment or development can be measured by the resulting changes in rents. 5/ Freeman has also shown that the marginal willingness to pay for improvements in land is equal to the marginal differential in land rents with respect to an improvement. 6/ In general, the difference between the value of an improved and an unimproved land parcel is an upper-bound estimate of the benefits from an improvement. 7/ Therefore, whenever resource development has taken place, the consequences of this development should be measurable in changed land values. 8/

This process assumes that buyers of land have evaluated the stream of net earnings that will accrue to the land over time and that they will pay no more than the expected value of this income stream discounted to the present. If the income stream is expected to be fairly even and certain, a rather simple formula can be used to solve the discounting problem. Uncertainty in the income stream presents a much more complicated discounting formula.

5/ Robert C. Lind, "Spatial Equilibrium, The Theory of Rents and the Measurement of Benefits from Public Programs," Quarterly Journal of Economics, Vol. 87, No. 2, May 1973, pp. 188-207.

6/ A. Myrick Freeman, III, "A Survey of the Techniques for Measuring the Benefits of Water Quality Improvement," Cost Benefit Analysis and Water Pollution Policy edited by Henry M. Peskin and Eugene P. Seskin, The Urban Institute, Washington, D.C., 1972. Also A. Myrick Freeman, III, "On Estimating Air Pollution Control Benefits from Land Value Studies," Journal of Environmental Economics and Management, Vol. 1, No. 1, May 1974, pp. 74-83.

7/ Robert C. Lind, "Spatial Equilibrium, The Theory of Rents and the Measurement of Benefits from Public Programs: Reply," Quarterly Journal of Economics, Vol. 88, No. 3, August 1975, pp. 474-476.

8/ It should be noted that land value enhancement accrues strictly to landowners.

The formula for capitalization used in the computation of land values can be expressed as: $V = \frac{a}{(1+r)}1 + \frac{a}{(1+r)}2 + \frac{a}{(1+r)}3 + \ldots + \frac{a}{(1+r)}n$, where V = value of property; a = annual net income; and r = the capitalization, discount, or interest rate. This formula reduces to $V = \frac{a}{r}$ when an infinite time period is considered and the variables a and r are constant and known with certainty.

The selection of an interest rate at which income is capitalized is crucial. The higher the interest rate, the less weight is given to future earnings (shorter recovery period) and the lower the estimated land values. The lower the interest rate, the greater the weight given to future earnings (longer recovery period) and the higher the estimated land values.

To the extent that land markets operate effectively (no overriding variables and/or speculation), resource development should lead to increased land values. However, if no increase in land values is detectable, any of a number of factors can be responsible. Breakdowns in the market mechanism plus inadequacies in measuring techniques are the principal problems in accurately determining value changes.

Breakdowns in the market mechanism can occur as a result of the inability of land market participants to recognize and adequately account for resource development. The resource development undertaken may have been unwise, and therefore not productive capacity increasing or land enhancing. Market imperfections due to monopolistic practices, emotions, lack of information on price and productivity, etc., may mask or prevent the market system from working. Investments may be so production or site specific that no alternative use is feasible or allowed to take place. Finally, breakdowns in the market mechanism can often occur when investments made at one place are for the benefit of other locations.

The investments made through the Small Watershed Program are frequently made in one location for the benefit of other locations. It is because the watershed program makes investments of this kind that the program is primarily financed through Federal money. Only public institutions can effectively finance investments which display this kind of separation between lands where structures are built and lands where benefits accrue, given different ownerships.

Another problem which may interfere with the effective operation of the market mechanism is the shifting of land from a producer input to a consumer good. When land is used as a producer input, classical rent theory holds that productivity differentials will yield differential rents to land and therefore differential land values. Competition and free entry assure the escalation of land rents and prices to eliminate any surplus or profit. 9/

When land is used as a consumer good, several difficulties arise. The elimination of surplus or profit, as in the producer input case, is no longer necessarily valid because productivity cannot be unambiguously defined. A consumer may be totally willing to pay higher than the discounted future rent charged for a particular site, and therefore can earn a consumer surplus.

9/ A. Myrick Freeman, op. cit.

Without all individuals having identical utility functions there may be no one else willing to bid up the land rent to eliminate the surplus. 10/

When land is shifted from a producer input to a consumer good, the price of land will likely change. However, the change in prices are observations from different demand functions, not observations along the same demand curve. Therefore, the comparison of the price of a parcel of land after it has become a consumer good with its price when it was a producer good may not be entirely valid. However, it is felt that such price changes can be used as estimates of the impact of resource development programs that have initiated the change in land use. The difference between land values of an improved and an unimproved land parcel is an estimate of the maximum benefits from an improvement.11/ The difference is a maximum estimate because there are variables, other than the development program, which may simultaneously influence land value changes.

PERCEIVED LAND VALUES

The perceived land value technique used to estimate land value changes attributable to small watershed development is based upon discussion with realtors, assessors, land appraisers, Soil Conservation Service (SCS) personnel, and others familiar with local conditions in Colorado, Kansas, Nebraska, Oklahoma, and Texas. There are some inherent problems and pitfalls with this type of approach. Of major concern is the problem of bias that this type of approach encourages or is unable to sort out.

Opinions and general estimates of land value changes due to the Small Watershed Program varied considerably. Many of the people interviewed felt that differences between State and local geographical areas may make an overall assessment of the watershed program unreliable. For example, climatic and location differences were considered to be important in understanding the impact of the program on local land values. Because of the different or unique sets of factors associated with each land parcel, realtors and appraisers frequently were unable or unwilling to give estimates of the impact of capital investments on land values. The usual argument was that unless one knows the characteristics of a particular property, it is very difficult to accurately estimate its value. Because land value variation is so great, general estimates need to be qualified to account for local conditions.

The high rate of inflation that has plagued the U.S. economy in recent years also adds a complicating factor to any estimation of dollar values. Inflation has tended to mask many of the smaller or less important factors that normally would affect the market for land. The high rate of inflation has encouraged speculation of all kinds, which in turn has led to many distortions in the land market.

Because of the diverse background of the people interviewed, one of the first tasks was to determine how aware they were of the Small Watershed Program. These people were divided into three groups. The first group included realtors, private land appraisers, and others closely linked to the real estate business.

10/ Ibid.
11/ Lind, op. cit.

The second group included Government officials at either the Federal or State level, such as personnel with the Soil Conservation Service, Corps of Engineers, and the Agricultural Stabilization and Conservation Service. The third group included local county officials such as county clerks and tax assessors. Table 1 shows to what extent these groups were aware of the Public Law 566 Small Watershed Program. Of the 22 people classified as realtors, 20 had knowledge of the program. Of the 20 that knew of the program, 5 had only rudimentary knowledge of the program and its existence in the local area. All 12 Federal officials had an understanding of the program. As a group, the county officials were the least knowledgeable of the program. Only half of the county officials with whom discussions were held were considered to be knowledgeable of the program; the remainder knew of the program but were unaware of its purposes and objectives.

Table 1 also gives qualitative estimates of land value changes resulting from the watershed program. Estimates were sought concerning farmland, urban, downstream, and structure site values.

The general assessment by the realtor group indicates that most perceived some enhancement in land values due to the Small Watershed Program, although almost one-third felt there was no effect or that the program actually decreased land values. Decreases in land values in small watershed locations were usually considered to depend on extenuating circumstances. Only a few people in the realtor group felt that large increases in land values had taken place. There were no major differences between the directional value changes of farmland or urban land as estimated by realtors. Neither was there any major difference between downstream and structure site value changes.

Most of the Government officials interviewed felt the watershed program increased land values. Farmland was estimated to show larger value changes than urban properties. Downstream lands were estimated to be affected more favorably by the program than structure sites. The flood protection aspects of the program were considered to be more significant than onsite benefits. No one in this group felt that the program decreased land values.

In their work, the county clerks, tax assessors, and other county officials do not generally give much consideration to the effects of the Small Watershed Program. When recognition of the program is made in the work context, the result is generally to decrease assessed land values. Only 2 of the 10 county officials viewed the program as being beneficial to downstream land values because of flood protection. In reference to structure site lands, six of the clerks and assessors interviewed did not change assessed values to account for program development while the other four decreased assessed values. Decreased assessment of structure site land values results primarily from State laws rather than an actual assessment of property values.

In addition to the different general estimates of land value changes due to the program by the three groups, there were also major differences in land value estimates depending upon location and climatological conditions. Because of the location and climatological differences, the impact of the program varies among States. Therefore, an examination of the circumstances in each State seemed appropriate.

Table 1--Realtors' and government officials' awareness of P.L. 566 program and their estimation of its effect on land values

Item	Realtors and land appraisers	Government officials	
		Federal and State	County clerks and tax assessors 1/
	Number		
Awareness:			
Knowledgeable	15	12	5
Partial knowledge	5	0	3
Minimal knowledge	2	0	2
Program effect:			
Farmland values			
Large increase	4	7	0
Some increase	11	4	0
No effect	5	1	4
Decrease	2/ 2	0	4
Urban values			
Large increase	2	5	0
Some increase	14	7	0
No effect	6	0	10
Decrease	0	0	0
Downstream values			
Large increase	4	8	0
Some increase	12	3	2
No effect	5	1	8
Decrease	2/ 1	0	0
Structure site values			
Large increase	3	3	0
Some increase	3/ 11	7	0
No effect	6	2	6
Decrease	2/ 2	0	4

1/ The estimated program effect on land values by county clerks and assessors is not necessarily their personal assessment, but reflects how the program effects are treated in their professional capacity.

2/ The estimation of a decrease in land values of one realtor is based on the impact of the program and local zoning laws.

3/ One realtor estimated land values would increase slightly or decrease, depending on where the surrounding land was situated in relationship to the dam.

Colorado

The realtors interviewed in Colorado assess the impact of the Small Watershed Program on rural land values to be minimal. There may be some enhancement of downstream values, but around project structures there does not appear to be any noticeable impact. These realtors generally attribute the minimal impacts to a lack of impoundable water. The lack of impoundable water for small watershed development is due to the low precipitation in eastern Colorado and Colorado water law. Colorado water law prohibits impoundment of appropriated water; and since most streams are overappropriated, new impoundment structures must be drained within 48 hours unless special provisions are made. 12/ Even where water rights are acquired for recreation purposes, such as in the Big Sandy Creek watershed, there does not appear to be any enhancement of land values. Since this watershed site is in the open plains, the appeal of the location to potential recreation home buyers has been minimal. 13/

In areas where subdivision activity is taking place, the prevailing opinion was that the existence of dry structures and county zoning laws has reduced land values. Dry structures provide little, if any, aesthetic enhancement. Zoning laws, which prohibit building in the 100-year flood plain, prevent residential development near the structure sites. Subdividers must set aside flood plain lands for open space purposes. Therefore, flooding problems are being institutionally prevented and benefits from flood protection are not readily captured by local landowners. Enhancement due to flood protection has not increased land values because zoning laws prevent residential use of these lands. Land values in the flood plain revert to grazing or farming values since the land is not accessible for subdivision. Such land does retain its aesthetic value for those who live in the area, but what the value of a green belt is has not been determined.

Another factor which is felt to minimize the impact of flood protection on land values in Colorado is that the main beneficiaries of the program have been the county and State governments. This is the result of protection to roads and bridges. Roads and bridges often sustain heavy flood damages on the intermittent streams in the area. Floods in this area tend to be of the flash-flood type, making public structures the most susceptible because they form natural barriers to the rapid movement of flood waters. With the major benefits of flood protection accruing to the public, all taxpayers gain. However, the benefits are so widely and thinly distributed that the effect on land values is not recognizable.

12/ Wells A. Hutchins, Water Right Laws in the Nineteen Western States, Vol. 1, Miscellaneous Publication No. 1206, ERS, USDA, 1971. See chs. 5 and 8.

13/ People interested in recreation property in Colorado are more likely attracted to purchase mountain property. See John Knapp, Monty Washburn, and Forrest Walters, Colorado Rural Land: Farm and Recreation Land Values, Colo. State Univ. Experiment Sta. Bulletin, General Series 957, Ft. Collins, Colo., July 1976.

Kansas

An assessment of the land-value effects of Public Law 566 projects in Kansas falls into two major categories, depending on where the projects are located. The climatological differences between the western and eastern parts of the State are quite pronounced. The western portion is much drier than the eastern, and, as a result, agricultural practices are significantly different. The impact of projects in the western part of the State is comparable to the impact of projects in Colorado.

In the eastern portion of Kansas, where average rainfall is more abundant, flood hazards are higher and more frequent. Project structures in this area are designed and built to hold water on a more or less permanent basis. As a consequence, the impact of the structures is greater and more readily recognized. The major benefits from the Public Law 566 structures usually accrue downstream in the form of flood protection. It was estimated that flood protection enhances the value of bottom lands by $75 to $100 per acre or about 20 percent of current land values. The impact of the ponds themselves on land values is recognized only indirectly through the benefits they impart on surrounding grazing lands. The ponds provide additional stock water which enables better utilization of surrounding grazing lands and helps increase pasture stock rates. The dollar value of these benefits varies from site to site, depending on how critical the need for this additional water is.

Land converted by the Small Watershed Program to ponds and lakes is assessed for tax purposes as wasteland, which has the lowest assessment rate. In most cases, this means lowering assessment values on pond acreages. There is a provision in the Kansas tax law which forces this determination, regardless of the actual value of these properties. The law provides that these wasteland assessment rates be maintained at the specified rate for 10 to 20 years on any structure site if it is supported through State or Federal assistance. Kansas taxing authorities also do not give any consideration to the downstream impacts of the Public Law 566 program on land values. This is also due to the fact that land assessment is done under a State-dictated formula which does not take any enhancement effects of such programs into consideration. Lower property taxes as a result of the program are a benefit that is easily captured by landowners. Property taxes are a basic expense which a farmer must pay from his gross income before determining his net return per acre. Reducing taxes will increase profits and, therefore, the profitability of the land. In principle, this increased profitability will be capitalized at the relevant rate and the land will be worth more. 14/

Nebraska

Nebraska can also be divided into a drier western region and a more humid eastern portion. As a result, the impact of the Public Law 566 program is

14/ The effect of a reduction in property taxes on current land value can be calculated with the following formula $V = \frac{a}{r+t}$ where V = value of property; a = annual net income; r = the capitalization rate; and t = the effective property tax rate.

similar to that in Kansas. Southeastern Nebraska is a general agricultural area, with most of the land devoted to the production of feed grains. All of the realtors and land appraisers interviewed in this area take the watershed program into consideration when making land value assessments. The overall consensus is that the watershed program does enhance land values both around the structures and downstream. However, it was felt that the major enhancement effects took place on those properties given flood protection. Estimates of land value enhancement due to flood protection amount to $40 or $50 per acre. This is less than 10 percent of overall farmland values of about $600 per acre.

The effect on land values in close proximity to Public Law 566 structures was felt to be small. Estimates of enhancement on these lands usually was considered to be about half of that which occurs on downstream lands. The major portion of the enhancement in land values due to the ponds was attributed to the recreation they provide. Most reservoirs are maintained as private fishing and hunting sites, with some rented or leased to private clubs for hunting and fishing. However, there is little information available about charges made for the rented or leased land. 15/

In the case of reservoirs large enough to provide irrigation water, estimates of the value of the sites increased substantially. However, few of the Public Law 566 reservoirs provide significant amounts of irrigation water because of size restrictions. Of more importance to the land market in this area of Nebraska was the fact that watershed structures can preclude sprinkler irrigation development. Therefore, if a sprinkler irrigation system is anticipated or planned, land values at or near reservoir sites are heavily discounted. The exact location of the reservoir site in relationship to the land considered for irrigation development is of critical importance. A reservoir site in the pivotal path of a sprinkler system can prevent the efficient operation of the system by reducing the acreage that can be covered and/or by requiring the installation of a more expensive, reversible sprinkler.

For property tax purposes, Nebraska follows an assessment procedure that is similar to that used in Kansas. Acreages on which project structures and reservoirs are located are assessed at $5.00 per acre. This is equivalent to wasteland assessment values. Here again, the procedure is dictated by State law. No definitive answer was obtained as to why this practice is followed. Perhaps it is an incentive to advance and speed up the construction of watershed structures throughout the State. Another partial explanation is that Nebraska agricultural property tax laws recognize only crop production. Therefore, any acreage devoted to water retention is considered nonproductive.

In general, the effects of the Small Watershed Program are considered by realtors and land appraisers in Nebraska, but they do not view the impact of

15/ A recent study on land leasing rates for waterfowl hunting indicates that the average gross income was approximately $3.50 per acre. See Otto P. Thiemann, Working Paper #18. Enhancing Waterfowl Habitat: Alternatives in Northern Mississippi River Delta Watersheds, NRE, ERS, USDA, Aug. 1976. See also Robert M. Hatcher, "Floodwater Retarding Structures as Fish and Wildlife Habitat," Wildlife and Water Management Striking a Balance, Soil Conservation Society of America, Ankeny, Iowa, 1973.

the program on land values to be substantial. Flood and erosion control benefits are considered by realtors to be partially capitalized into land values.

Oklahoma

Oklahoma, like Kansas and Nebraska, has a dry western area and a more humid eastern area. The people interviewed in this State were of the general opinion that land values increased in central Oklahoma as a result of small watershed projects. Their focus, however, was on urban land values because of the proximity of Oklahoma City. Realtors throughout this area give only small consideration to the impacts of the projects on rural land values. However, lakes developed with the help of the program do enhance upland values if no other stock water is available. Estimates of land value enhancement due to lake development were about $50 per acre or 10 percent of upland values if no other stock water is available.

Appraising land values throughout this whole general area is extremely difficult because of the importance of mineral rights. Mineral rights have become more important in recent years because of the large change in gas and oil prices. Gas and oil are present throughout much of this area. Proximity to a producing well has an important effect on land values. Each transaction has to be considered separately because various percentages of mineral rights may be transferred. Some sales are for land without mineral rights, while others may include all of the mineral rights.

Project lakes have a larger impact on property values when they are within a reasonable distance of urban areas. Lake properties usually bring a premium for development purposes. It is difficult to estimate the enhancement effect because much depends on the scenic and topographical features of the land. Ownership distribution is considered a major factor in assessing properties near project lakes. Where ownership is divided between several properties bordering the lake, the enhancement effect is considered to be significantly diminished. Potential ownership conflicts between the involved parties tend to outweigh any potential capitalized benefits.

There is evidence that some project properties have been leased or rented to private hunting and fishing clubs for recreation purposes. What arrangements made and rental charges collected were not discovered. Claims of land value enhancement due to leasing arrangements around project lakes ranged from 25 to 100 percent of general land values of $600 per acre. Confirmation of exact dollar enhancement is difficult, since most of these properties are still held by their original owners.

County tax assessors in Oklahoma do not consider the Small Watershed Program when they assess land values. Rural lands are assessed strictly on the basis of soil types and productivity. Even though it is generally contended that soil types and associated productivity indexes make adequate provision for periodic changes such as flooding, special discounts may be given to bottom land properties that are subject to severe and frequent inundation.

Texas

In general, the land market in Texas, as elsewhere, has been following an inflationary trend accompanied by a considerable amount of speculative activity. However, 1976 saw a significant decline in this speculative activity in Texas. Land values have softened, with actual instances of significant decreases in individual property values.

Realtors felt that watershed projects tend to increase land values around water impoundments by about $100 per acre, or by 30 to 50 percent. However, this assessment was usually accompanied by several qualifications--primarily concerning the size of tracts being offered for sale, and the location of the property and its accessibility. Properties sold in about 100-acre tracts around watershed lakes with single party ownership were considered to have increased significantly in value as a result of the watershed projects. However, land in large acreages or reservoir sites with potential multiple ownership were considered to be significantly less valuable. Important site characteristics also included accessibility to hard-surfaced roads, the amount of land inundated during flood periods, the natural ruggedness of the area, and the recreation potential of the site. As it turns out, such property is generally the least desirable for agricultural production.

From a strictly agricultural point of view, the watershed reservoirs in Texas have added little to land values. For agriculture, the major benefits stem from the flood protection effects of the projects. Because bottom lands sell at a premium over uplands for agricultural production, flood protection is of importance. Most bottom lands are used for cropland, while most of the uplands are devoted to grazing purposes. Agriculture uses the reservoirs primarily for livestock watering. Occasionally, some of the reservoirs can be used for supplemental irrigation purposes, but, in general, these small watershed lakes do not provide enough water to expand irrigated acreages.

Texas tax assessors do not consider watershed projects in their assessment work. Therefore, the assessed value of property tends to vary by taxing authority. Generally, property is to be assessed at one-third of its market value, but agricultural land has an upper limit of $80 per acre.

In some of the watersheds examined, there is a demand for permanent suburban home sites. The demand for 2- to 10-acre tracts, especially along hard-surfaced roads on the outskirts of intermediate-sized cities, has resulted in a dramatic increase in land values of these small acreages. Sites of this type sell for from $1,200 to $3,000 per acre, depending on the characteristics of each site. Even though some of this demand has occurred and continues to occur within project watersheds, the primary focus has not been around watershed reservoirs. Therefore, there is no justification to attribute the increased land values to the watershed program.

However, in other watersheds examined, part of the increased value of land can be attributed to the watershed program. In Texas, the major evidence of this is in those areas that are relatively poor agriculturally and where the topography and vegetative cover give the area a wildlife potential. Project reservoirs in these areas on about 100-acre tracts with single ownership of the

lake exhibit the greatest enhancement values according to local realtors. Properties that do not include or lack some of these characteristics exhibit only marginal land value enhancement due to the watershed program.

ANALYSIS OF NEBRASKA AND OKLAHOMA LAND SALE DATA

Nebraska and Oklahoma are engaged in purchasing and selling land to facilitate small watershed development. This is accomplished through the respective State agencies concerned with soil and water conservation, flood prevention, watershed protection, and flood control--the Oklahoma Conservation Commission, and the Nebraska Natural Resources Commission. To facilitate the work of the commissions, each State has a revolving fund which can be used to buy land. Land purchased through these funds is used to install small watershed structures. After construction, the structure site land is sold and the proceeds returned to the fund.

The Oklahoma revolving fund, established on a temporary basis in 1955 with an allocation of $50,000 from the Governor's emergency fund, was given permanent status by enabling legislation and another $50,000 in 1957. 16/ The fund has grown to approximately $1.5 million in fiscal 1976 with continued State support and annual appropriations of $75,000 to $100,000.

The Nebraska revolving fund was activated with an appropriation of $200,000 in 1965. Since then, it has been expanded by $75,000-$100,000 a year, and the current value is about $1.9 million.

Data pertaining to the purchase and sale of land through the revolving funds were obtained from the respective State agencies. The data are limited because of the limited monies and the restrictive conditions under which the funds can be used. Nebraska statutes list 13 conditions which must be met before State funds may be used "to pay the cost of purchase of needed lands, easements, and rights-of-way for soil and water conservation and flood control needs or cost share with local organizations." 17/ Oklahoma policy lists 11 conditions regulating the purchase and sale of land with revolving funds. 18/ One of the most restrictive conditions is the requirement stating the percentage of easements that need to be acquired by the local district before State funds can be used. In Nebraska, this requirement is placed at 75 percent of needed easement acreage, while in Oklahoma the requirement is 90 percent of needed easement acreage.

Administrators of the funds in both States are of the opinion that the data may be somewhat biased because the funds are generally used in problem situations. Therefore, the land purchased may not accurately reflect the majority of structure sites. The administrators also indicated that the purchase price of the structure site land is frequently inflated to avoid costs of condemnation and court litigation. In addition, the administrators said that the

16/ Oklahoma State Law 1957, Chapter 20c, Title 2.
17/ Nebraska Statutes R.R.S. 1943, Section 2-1502.
18/ State Soil Conservation Board Minutes, November 8, 1957, "Policy Concerning Expenditure of Funds from Revolving Fund." See also chapter 20c, title 2, Oklahoma State Law 1957, and Oklahoma Senate Bill 10, 1959.

sale price may be biased downward, even though the parcels generally are sold at auction for more than their purchase price, because (1) there are only a limited number of buyers for the lands, (2) access to these land parcels is usually restricted, and (3) original owners are frequently given preferential consideration.

Even though the purchases by the State commissions are confined mostly to problem cases, and the purchase and sale data may contain some bias, the following analysis uses the data on the basis that the data are the best available for estimating the impact of watershed construction on land values. The reasons are: (1) the data are restricted to sites on which construction is intended or has occurred, (2) both purchase and sales data are available, (3) with the State as purchaser, the economic circumstances of each transaction are normalized, (4) the procedures surrounding each purchase and sale are the same, and (5) the cost in terms of time and money to gather the data was greatly reduced.

During the past 20 years, the Oklahoma fund has purchased over 10,400 acres for about $1.7 million, or about $163 per acre. Land purchased through this fund is held only for as long as is necessary to complete construction of needed structures or obtain adequate easements. The average holding period of the properties sold to date has been about 4 years.

The Nebraska fund has been active in land purchases for the past 10 years and has purchased 45 parcels totaling approximately 5,600 acres for a total cost of about $1.74 million, or about $310 per acre. The average holding period of the Nebraska properties has been about 5 years.

Table 2 displays the number of acres purchased and the average purchase price in Oklahoma and Nebraska during 1956-76. The number of acres purchased varies considerably from year to year. Oklahoma purchases ranged from a low of 45 acres in 1959 to a high of almost 1,200 acres in 1973. 19/ Nebraska purchases ranged from 146 acres in 1967 to over 1,300 in 1970. The average purchase price per acre ranged from a low of $37.41 in 1956 to a high of $393.18 in 1974 in Oklahoma, and from $161.46 in 1967 to $617.57 in 1975 in Nebraska. During the past 20 years, the Oklahoma fund has been used to purchase an average of 560 acres per year during its 10 years of operation.

Sale of land purchased through the Oklahoma revolving fund has totaled approximately 7,675 acres, returning to the fund about $950,000. The 7,675 acres represent 101 purchased parcels of land which were sold in 77 sales. Of the 77 sales, 43 sold for more than their purchase price, 7 sold for the same as purchase price, and 27 sold for less than purchase price. The total gain for the 77 sales amounted to approximately $25,000, or about $3.00 per acre (table 3). 20/

19/ The purchase of only 10 acres in 1976 by the Oklahoma fund was not considered in this comparison because of the partial nature of the 1976 data.

20/ None of the gains or losses shown for the Oklahoma revolving fund include the over $25,000 worth of expenses and the over $55,000 worth of income generated during ownership.

Table 2--Watershed land purchased through State revolving funds, by acres purchased and average annual purchase price, Oklahoma and Nebraska, 1956-76

Year	Oklahoma		Nebraska	
	Acres purchased	Avg. purchase price/acre 1/	Acres purchased	Avg. purchase price/acre 1/
	Acres	Dollars	Acres	Dollars
1956	520.00	37.41	NA	NA
1957	999.13	99.01	NA	NA
1958	925.00	80.06	NA	NA
1959	45.00	63.18	NA	NA
1960	180.00	75.89	NA	NA
1961	912.87	100.78	NA	NA
1962	1,019.59	72.83	NA	NA
1963	512.50	167.40	NA	NA
1964	217.50	121.82	NA	NA
1965	438.75	120.27	NA	NA
1966	680.27	191.13	349.0	248.29
1967	800.32	150.10	146.0	161.46
1968	327.66	307.08	654.0	290.88
1969	385.00	166.62	743.0	254.17
1970	202.50	119.54	1,340.2	231.49
1971	90.00	126.33	410.0	325.72
1972	191.00	244.34	625.0	340.10
1973	1,182.32	309.44	636.0	274.57
1974	557.55	393.18	451.6	598.35
1975	226.00	340.67	259.0	617.57
1976 2/	10.00	302.30	NA	NA
Total	10,422.96	163.34	5,613.8	309.65

NA = Not available. (Nebraska data nonexistent prior to 1966.)

1/ Purchase prices are actual purchase prices and do not include expenses and/or income during ownership.

2/ Data for 1976 cover purchases only through March.

Table 3--Actual land purchases and sales by Oklahoma and Nebraska for small watershed development

Item	Unit	Oklahoma 1956-76	Nebraska 1966-75
Total acres purchased	No.	10,422.96	5,613.80
Parcels purchased	do.	139	45
Total cost	Dol.	1,702,487.00	1,738,305.00
Average cost per acre	do.	163.34	309.65
Total acres sold	No.	7,675.28	2,872.20
Parcels sold	do.	101	24
Sales 1/	do.	77	23
Total sale price	Dol.	951,141.00	908,233.00
Average sale price per acre	do.	123.92	316.22
Total cost of acres sold	do.	926,351.00	731,146.00
Average cost of acres sold	do.	120.69	254.56
Total gain 2/	do.	24,790.00	177,087.00
Average gain per acre	do.	3.23	61.66

1/ Number of sales differs from number of parcels sold because in some cases more than one parcel was sold in one transaction to one buyer.
2/ Total gain is the total sale price minus total cost of acres sold.

Source: Oklahoma Conservation Commission and Nebraska Natural Resources Commission revolving fund records.

The Nebraska fund has sold a total of 2,872 acres of land in 24 parcels. The 24 parcels have been sold in 23 sales for just over $908,000, or about $316 per acre. The average purchase price of the acres sold was about $255 per acre. This has resulted in a gain of about $177,000, or $61.66 per acre. Of the 23 sales, 12 have sold for more than purchase price, 4 sold for the same as purchase price, and 7 have sold for less than purchase price (table 3).

Table 4 shows actual and hypothetical land sale data for Oklahoma and Nebraska. The hypothetical price is that price at which the land would have sold if the land had inflated in price by as much as each State land value index. For example: an Oklahoma parcel of land was purchased in September 1967 for $10,000 and sold in June 1972. 21/ The Oklahoma land value index for September 1967 equals 100. The index for June 1972 equals 131. 22/ The ratio of these indexes was multiplied times the actual purchase price to give the hypothetical price, 131 ÷ 100 X $10,000 = $13,100. The $13,100 was assumed to be the price this parcel of land would have sold for if it followed the trend of all farmland in the State and if the watershed program had no effect on the sale price.

Table 4 shows the total hypothetical price for Oklahoma was about $1.3 million, or $170 per acre. The total hypothetical price for Nebraska was about $1.2 million, or $409 per acre. Comparing the hypothetical price to actual sale price indicates Nebraska lost over $250,000, or about $93.00 per acre on the land sold. The same comparison for Oklahoma indicates a loss of over $360,000, or $47.00 per acre sold.

Table 5 displays actual and hypothetical average sale and purchase prices for Oklahoma. The average sale price per acre shows a general upward trend with two brief periods of decline. Average sale prices were lower in 1962 and 1963 than in previous years and again during 1969-71. Since there were no sales in 1970, one can only speculate that prices were lower during that year. However, the average purchase price of land in 1970 was also down (table 2).

The difference between the actual average sale price and purchase price per acre (col. 4) indicates that the Oklahoma fund generally sustained a loss from 1957 to 1969, except for 1960, 1966, and 1968. The fund has shown an annual gain per acre since 1971. The largest gain on a per acre basis was made in 1974, when the average sale price was $113 more than the average purchase price per acre.

Column 5 of table 5 indicates the average hypothetical price per acre for Oklahoma. As mentioned above, the hypothetical price is that price at which land should have sold if it had inflated at the same rate as the farmland value index for Oklahoma during the time it was owned by the revolving fund. Since

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21/ The month was included since the index of average value per acre was available for March and November of each calendar year. The March index was assumed to apply for all sales during March-October. The November index was assumed to apply for all sales during November-December and January-February in the following calendar year.

22/ For index values, see USDA-ERS, Farm Real Estate Market Developments, June 1973, pp. 7 and 11, and Jan. 1974, p. 5, and USDA-ERS, Agricultural Outlook, 1974-1975 issues.

Table 4--Actual and hypothetical land purchases and sales by Oklahoma and Nebraska for small watershed development 1/

Item	Unit	Oklahoma 1956-76	Nebraska 1966-75
Total acres sold	No.	7,675.28	2,872.20
Total sale price	Dol.	951,141.00	908,233.00
Average sale price per acre	do.	123.92	316.22
Total hypothetical price (acres sold)	do.	1,312,197.00	1,175,290.00
Average hypothetical price per acre (acres sold)	do.	170.96	409.20
Total loss 2/	do.	361,056.00	267,057.00
Average loss per acre	do.	47.04	92.98

1/ Hypothetical price is actual purchase price inflated for the holding period (time of purchase to time of sale) by the ratio of land value indexes for each year for each State.

2/ Total loss is the total sale price minus the total hypothetical price of acres sold.

Source: Oklahoma Conservation Commission and Nebraska Natural Resources Commission revolving fund records.

Table 5--Actual and hypothetical average sale and purchase prices, Oklahoma, 1957-76

Year	(1) Acres sold	(2) Actual avg. sale price/acre, all sales	(3) Actual avg. purchase price/acre of acres sold	(4) Difference (2) - (3)	(5) Avg. hypothetical price/acre of acres sold	(6) Difference (2) - (5)	(7) Sale price divided by purchase price (2)÷(3)	(8) Sale price divided by hypothetical price (2)÷(5)
	Acres	Dollars					Percent	
1957	40.00	50.00	91.45	<41.45>	91.45	< 41.45>	54.67	54.67
1958	425.00	51.21	69.35	<18.14>	87.14	< 35.93>	73.84	58.77
1959	259.13	51.87	57.12	< 5.25>	63.84	< 11.97>	90.81	81.25
1960	175.00	73.79	72.99	.80	84.95	< 11.16>	101.09	86.68
1961	120.00	70.92	74.76	< 3.84>	78.46	< 7.54>	94.87	90.39
1962	140.00	45.52	47.01	< 1.49>	59.61	< 14.09>	96.82	76.36
1963	826.49	57.88	65.78	< 7.90>	92.87	< 34.99>	87.99	62.32
1964	631.00	80.68	81.47	< .79>	102.51	< 21.83>	99.03	78.70
1965	720.60	106.84	109.61	< 2.77>	161.17	< 54.33>	97.47	66.29
1966	311.87	114.12	110.97	3.15	161.12	< 47.00>	102.84	70.83
1967	326.25	121.70	141.67	<19.97>	192.21	< 70.51>	85.90	63.32
1968	57.50	154.09	136.47	17.62	154.78	< .69>	112.92	99.55
1969	551.78	122.33	136.70	<14.37>	117.80	4.53	89.49	103.85
1970[1/]	--	--	--	--	--	--	--	--
1971	710.00	92.55	87.65	4.90	151.95	< 59.40>	105.60	60.91
1972	1,533.00	165.78	164.67	1.11	239.75	< 73.97>	100.68	69.15
1973	317.66	226.41	225.24	1.17	324.91	< 98.50>	100.52	69.68
1974	320.00	251.72	138.45	113.27	234.61	17.11	181.82	107.29
1975	160.00	412.50	406.88	5.62	606.24	<193.74>	101.38	68.04
1976[2/]	50.00	300.00	250.92	49.08	357.58	< 57.58>	119.56	83.90

1/ There were no land sales from the Oklahoma revolving fund in 1970.
2/ Data for 1976 cover sales only through June.

the hypothetical price is dependent on the purchase price of land sold in any one year and the index of farmland values during the holding period, it does not follow the same trend as sale or purchase price. The average hypothetical price per acre fluctuates much more than does either the average purchase or selling price. The hypothetical price is lowest for 1962 and highest for 1975.

The hypothetical price tends to exceed the actual sale price in most years, with the difference ranging from a low of 69 cents per acre in 1968 to a high of $193.74 per acre in 1975 (col. 6). Only for 1969 and 1974 does the analysis show the actual price to be greater than the hypothetical price.

As indicated in column 7 of the table, in all but the first 2 years in which sales were made, the sale price has been at least 85 percent of the purchase price. Since 1971, the sale price has consistently been higher than the purchase price. Only in 1974 did the sale price exceed the purchase price by more than 20 percent.

Column 8 shows the annual average sale price as a percent of the hypothetical price. In this comparison, the sales price ranges from a low of 54.67 percent of the hypothetical price to a high of 107.29 percent.

Table 6 makes the same comparisons for Nebraska. Since sales of land through the Nebraska revolving fund have only taken place in the last 5 years, it is difficult to confirm any real trends. Except for 1972, the actual annual average sale price has exceeded the purchase price, with the increases ranging from $9.88 per acre in 1973 to $210.63 per acre in 1975. The actual sale price has ranged from 72 to 181 percent of the purchase price.

The sale price is below the hypothetical price (col. 5) for all of the years observed, with the difference ranging from $9.79 in 1974 to $185.91 in 1975. The average annual sale price per acre has ranged from 56.09 to 97.16 percent of the hypothetical price.

Table 7 shows the total sale price as a percent of the total purchase price for the two States. This table and the data presented above indicate that in actual dollars, there has been a slight overall enhancement in land values resulting from the watershed program. The gain is less than 3 percent in Oklahoma and less than 25 percent in Nebraska. Measured by the hypothetical prices, the data show the watershed program to have a negative impact on land values. The actual total sale price for Oklahoma is 72.5 percent of the total hypothetical sale price. For Nebraska, the actual total sale price is 77.3 percent of the hypothetical price.

The indicated price differences can be used as an estimate of easement or land right costs for Public Law 566 watershed development. From the data in table 7, it can be shown that for Oklahoma the cost of land rights or easements should be 27.5 percent of average land values (100.00 - 72.5 = 27.5). For Nebraska, the cost of land rights should be 22.7 percent of average land values (100.00 - 77.3 = 22.7). These contentions are based on the premise that if, after construction, land values amount to 72.5 and 77.3 percent of before-construction values, then only the lost value should be considered as a

Table 6--Actual and hypothetical average sale and purchase prices, Nebraska, 1972-76

Year	(1) Acres sold	(2) Actual avg. sale price/acre, all sales	(3) Actual avg. purchase price/acre of acres sold	(4) Difference (2) - (3)	(5) Avg. hypothetical price/acre of acres sold	(6) Difference (2) - (5)	(7) Sale price divided by purchase price (2)÷(3)	(8) Sale price divided by hypothetical price (2)÷(5)
	Acres	Dollars					Percent	
1972	293.2	237.39	325.87	<88.48>	348.45	<111.06>	72.85	68.13
1973	543.0	323.02	313.14	9.88	392.19	< 69.47>	103.16	82.36
1974	714.0	334.70	224.41	110.29	344.49	< 9.79>	149.15	97.16
1975	846.0	237.51	215.46	22.05	423.42	<185.91>	110.23	56.09
1976[1/]	476.0	469.16	258.53	210.63	537.80	< 68.64>	181.47	87.24

1/ All sales data for 1976 are included. Nebraska conducts land sales only once a year during January or February.

legitimate easement or land rights cost. Any payment above the lost land value becomes a windfall to the landowner and a transfer from other taxpayers in the local community. 23/

Table 7--Land purchases by Oklahoma and Nebraska for small watershed development: Total sale price as a percent of total purchase and total hypothetical price

Item	Oklahoma 1956-76	Nebraska 1966-75
	Dollars	
Total sale price 1/	951,141	908,233
Total purchase price 2/	926,351	731,146
Total hypothetical price 2/ 3/	1,312,197	1,175,290
	Percent	
Percent total sale price of total purchase price	102.7	124.2
Percent total sale price of total hypothetical price	72.5	77.3

1/ Actual dollar value of all acres sold.

2/ Total purchase price in actual dollar value for acres sold. Cost of acres still owned by the respective funds is not included.

3/ Total hypothetical price for acres sold. Hypothetical price is that price at which land would sell if it had inflated by as much as the State land value index.

Legally, no private property may be taken for public purpose without the payment of just compensation. 24/ "The courts have held that just compensation means the fair market value of the property taken, plus damages, if any, to the remaining property. The courts have also said that the landowner should be in the 'same pecuniary position' before and after the taking." 25/

Since it is the considered opinion of the administrators of the revolving funds that purchase price data used in this analysis tend to run high and sales price data tend to run low, the above estimates of easements or land rights

23/ Easement and land right costs are the responsibility of local sponsors, except when recreation is included as a project purpose. The cost of easements for recreation facilities is shared 50-50 between local and Federal funds.

24/ See U.S. Constitution, Fifth and Fourteenth Amendments.

25/ U.S. Department of Agriculture, Soil Conservation Service, Economics Guide for Watershed Protection and Flood Prevention, March 1964 plus revisions, ch. 13.

costs would tend to be high. 26/ Therefore, for Nebraska and Oklahoma it can generally be said that land right costs rarely should exceed 25 percent of actual land values. This is in agreement with court interpretation that landowners should be in the "same pecuniary position" before and after the taking of land rights.

SCS policy maintains that the real test of what constitutes the market value of an easement lies in what the general buying public does in the real estate market in discounting the prices paid for real estate where easements of similar type have been granted. 27/ The analysis above, which estimates the easement costs, meets this test. Easement costs have been estimated by looking at the prices paid for real estate where easements have been granted. It is through this method that the 25-percent estimate is made.

It is interesting to compare the average purchase price of land in fee simple with the average purchase price of land easements. Table 8 compares purchases made through the Nebraska Natural Resources Commission between 1967 and 1975 for these two purposes. Data for 1967-69 are combined in one figure and data for 1970-71 in another because yearly easement purchase data were not available. As can be seen from the table, easement costs in Nebraska have averaged approximately 55 percent of land purchase costs during the 9-year period, with the percentage ranging from 25 to 87 percent. From this comparison, it is concluded that easement costs have run about twice as high as necessary to maintain landowners in the same financial position before and after an easement is sold to the State.

Only Nebraska data were available to calculate actual easement costs. Therefore, the findings are not as general as would be liked. However, discussions with realtors and land appraisers in Colorado, Kansas, Oklahoma, and Texas lead one to believe that easement costs of 55 percent of fee simple land values are not excessively high. Most of these people estimated easement costs to be approximately 75 percent of fee simple land values, with some estimates placed at 90 percent of fee simple land values. Therefore, costs tend to far exceed the compensation necessary to leave landowners in the same financial position before and after the transfer of these rights. Accepting the estimates of easement costs made in this study, it would appear that several SCS policies concerning easements need to be carefully examined and possibly revised.

Soil Conservation Service policy requires that "Land, easement, or rights-of-way costs should reflect costs (values) of the land rights acquired without any adjustment for offsetting benefits." 28/ The use of this policy under a system of benefit-cost analysis may have accurately reflected the cost side of the ledger. However, since few if any enhancement benefits were attributed to structure sites, the relationship between benefits and costs were weighted in favor of costs. The evaluation of benefits and costs in relation to structure

26/ Discussions by the author with the administrators of the revolving funds in Nebraska and Oklahoma.

27/ SCS, Economics Guide, ch. 13.

28/ Ibid.

Table 8--Comparison of fee simple land purchase versus easement costs, Nebraska, 1967-75[1/]

Item	1967-1969	1970-1971	1972	1973	1974	1975	Total
				Acres			
Total fee simple acres purchased	1,543.0	1,750.2	625.0	636.0	451.6	259.0	5,264.8
Total easement acres	418.26	522.4	494.3	136.8	358.8	398.1	2,328.66
				Dollars			
Average per acre cost of fee simple purchases	260.96	253.56	340.10	274.57	598.35	617.57	313.72
Average per acre cost of easements	132.87	116.47	136.05	239.21	150.55	322.24	171.21
				Percent			
Percentage easements costs of fee simple purchase costs	50.92	45.93	40.00	87.12	25.16	52.18	54.57

1/ Easement data from the files of the Nebraska Natural Resources Commission. Data reflect watershed control and flood control easements and rights-of-way. Easement costs for utility (telephone and power) relocation and Corps of Engineers' levee development have not been included.

sites may be changed under the new multiobjective evaluation procedures, 29/ but currently it has not been recognized as a problem. Since all the data used in this study were generated during a time when benefit-cost analysis was used, little can be said regarding how easement costs will be handled under the new evaluation procedures.

The responsibility for estimating the value of land, easements, and rights-of-way has rested with local sponsoring organizations. The responsibility of the Soil Conservation Service has been limited to testing the reasonableness of local estimates to assure that all economic costs of land, whether purchased or donated, were included in project costs. 30/ It is concluded, based on the results of this study, that this policy has led to an overestimating of easement values. The reason for this is not that the policy was wrong from a technical or evaluation point of view, but that there was little research background and knowledge available to determine the accuracy of local estimates. Furthermore, since local sponsors and beneficiaries are responsible for estimating and paying land rights costs, there was a general feeling that such costs would be kept to a minimum. However, the general practice of relying on landowners to donate the necessary easements did not make the magnitude of easement costs a major financial obligation. That is, it made little difference to local sponsors what the magnitude of easement costs were if the easements were going to be donated. In recent years, because of the dramatic increase in land values and the general overvaluing of easements, landowners who donated easements bypassed large potential payments. As this practice grew, the impact on the Small Watershed Program became more severe. As land values rose and easement costs increased, landowners became more reluctant to donate the necessary easements. This resulted in watershed project costs becoming a greater burden to local sponsors, less enthusiasm for the program, and greater difficulty in justifying new projects.

REGRESSION ANALYSIS

Regression analysis was used to isolate some of the factors explaining land values and to determine the impact of the Small Watershed Program on land values. This analysis is based on data available from the Nebraska Natural Resource Commission and the Oklahoma Conservation Commission.

Analysis of the data was done by means of a stepwise multiple regression program. Statistical Package for the Social Sciences (SPSS version 6.0) was used to estimate the relationship between the variables. Several equations were obtained from various regression runs. However, only a limited number are presented here. These equations were selected because of their predictive ability and if the variables were significant at a 90-percent probability or better. The predictive equations can be grouped into two sets based on the dependent variable used. One set uses various forms of the selling price as the dependent variable, while the other uses purchase price variations as the dependent variable.

29/ Procedures promulgated in "Principles and Standards for Water and Related Land Resources," Federal Register, Vol. 38, No. 174, Part III, Sept. 10, 1973.

30/ SCS, Economics Guide, ch. 13. For a discussion of costs to be included, see USDA, SCS Watershed Protection Handbook, Jan. 1967, plus revisions, ch. 3.

Oklahoma

Appendix table 1 lists and defines the Oklahoma variables analyzed in one or more of the regression equations. Selling data were available for 101 sites in Oklahoma. Of the 101 sales, data were sufficiently complete for only 99 sites to be used in the regression analysis. Location information was obtained by plotting sites on county maps and then measuring the necessary distances. Distinctions between towns, cities, and urban centers were based strictly on 1970 population census data. Existing lakes, either natural or manmade, were used in an attempt to ascertain the availability or need for water-based recreation near each site. Existing lakes were located by examination of detailed county maps. The percentage change in county population was based on differences between 1960 and 1970 census data. 31/ Since the population data were available for only these 2 years, the significance of the percentage change in county population with respect to land values is weak. Per capita income data were not available or not definable for the parties involved in each sale; therefore, annual per capita personal income for the State was used. 32/

Deflated prices and income variables were used in some of the equations in an attempt to minimize the impacts of inflation. The price and income variables were deflated to 1967 values based upon the purchasing power of the dollar derived from the consumer price index 33/ or were deflated by State land value indexes. 34/

When actual selling price (price at which property was sold by the State) was used as the dependent variable and regressed against other variables, the following equation resulted:

$$P_s = -225.47^{***} + .637X_2^{***} + .013X_{11}^{*} + 3.72X_{12}^{***} \text{ 35/}$$
$$\qquad\quad (68.98) \qquad (.064) \qquad (.006) \qquad (1.28) \text{ 36/}$$

where P_s is price per acre at which property was sold by the State, X_2 is actual purchase price by the State, X_{11} is income in year sold, and X_{12} is year purchased. These variables explained about 80 percent of the variation in selling price (R^2 = .799) with 74 percent of the variation explained by purchase price. This result implies that the purchase price and the year land was purchased plus available income greatly influenced selling price. The signs of all three coefficients are positive and logical. It is interesting to note that none of the distance variables were significant in explaining the State selling price.

31/ U.S. Bureau of the Census, U.S. Census of Population 1960 and 1970.

32/ U.S. Dept. of Commerce, Bureau of Economic Analysis, Survey of Current Business and Business Conditions Digest.

33/ U.S. Bureau of the Census, Statistical Abstract of the United States 1975, and U.S. Dept. of Commerce, Bureau of Economic Analysis, Survey of Current Business.

34/ U.S. Dept. of Agriculture, Economic Research Service, Farm Real Estate Market Developments, June 1973, July 1974, and Agricultural Outlook, 1974-75.

35/ Variables were significant at *90%, **95%, ***99%.

36/ Standard error of beta values in parentheses.

Changing the dependent variable to actual selling price logged did not improve the predictability of the regression equations. The linear form seemed to explain the relationship better than a nonlinear form. Purchase price continued to be the dominant explanatory variable.

The use of deflated income and price data to eliminate the inflation effects had little impact on the explanatory power of the resulting regression equation. The same basic variables, only deflated, were significant, with a slight reduction in the R^2 value.

In general, regression analysis explains about three-fourths of the variation in the land sale price for Oklahoma. The significant variables are purchase price and year, plus income, either in year sold or purchased. None of the distance, size, or population variables were significant in explaining selling price with any degree of reliability.

Residual analysis was used to discover if any important explanatory variable was overlooked. The residuals represent the unexplained variation in the dependent variable after taking into account one or more of the significant independent variables. The residuals were listed and plotted on a unit normal chart. Of the 99 observations, 7 appeared as "outliers" (more than two standard deviations from the regression line). An examination of these 7 observations showed that, in all cases, the difference between selling price and purchase price per acre was greater than $100 per acre. With purchase price the most significant explanatory variable, it was only logical that such a large difference between purchase and selling price would result in these observations being "outliers." No other major differences between the 7 observations and the rest of the observations were discovered.

The Von Neumann ratio and the Durbin-Watson test also indicated that there was no significant autocorrelation in the regression analysis. Both of these tests are also used to check if there is a time-linked variable left out of the analysis. The "number of runs of signs" test was also conducted. The results of this test also indicated that the residuals are normally distributed and that no significant time-related variable was overlooked.

State purchase price was also used as the dependent variable in an attempt to find what differences there might be between the selling and purchasing markets for structure site lands. Several regression variations using State purchase price as the dependent variable were analyzed. Data were available for 139 sites. Actual purchase price as the dependent variable proved to have the best explanatory power, with an R^2 value of .635. The following equation resulted:

$$P_p = \underset{}{-26.32} - \underset{(24.05)}{3.64X_4}** - \underset{(1.85)}{2.18X_5}** + \underset{(1.03)}{.927X_9}** + \underset{(.48)}{.082X_{14}}*** \text{ 37/}$$
$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (.006) \text{ 38/}$$

where P_p is the price per acre at which the State purchased the property. The significant variables were X_4, miles to town; X_5, miles to city; X_9, miles to

37/ Variables were significant at *90%, **95%, ***99%.
38/ Standard error of beta values in parentheses.

lake; and X_{14}, income year purchased. Variables X_4 and X_5 both carry a negative coefficient, which indicates that as the distance to either a city or town increases, the purchase price decreases. This is generally considered a logical relationship. The distance to a lake variable, X_9, has a positive coefficient. This would indicate that as the distance to an existing lake increases, purchase price also increases. At first glance, this may not appear to be a logical relationship; however, when one considers that none of the properties purchased was close 39/ to an existing lake and the purpose of buying the property was to construct a watershed structure, a positive relationship is the most logical. The further the distance to an existing lake, the greater the desire on the part of sponsors to provide a lake. Therefore, sponsors were willing to pay a higher price for the more distant watershed sites.

Variable X_{14}, income in year purchased, is the most significant in explaining the purchase price. This variable was significant at the 99-percent level. Each dollar increase in average per capita income adds 8.2 cents to the average per acre purchase price. This variable explains 58 percent of the variation in purchase price. The four significant variables in this equation explain approximately 63 percent of the variation in purchase price.

Regression equations using deflated State purchase price or deflated State purchase price logged as the dependent variable explained less than 50 percent of the variation in purchase price. Income and distance to town and city continued to be the most significant explanatory variables. In addition, the percentage change in the population variable and the year purchased variable were significant at the 90-percent level. In the deflated purchase price equations, deflated income year purchased and miles to town explained about 40 percent of the variation in deflated purchase price. The other variables accounted for the other 6 to 7 percent of the explained variation.

Comparison of the results between the two dependent variable sets (State selling price, versus State purchase price) tend to indicate that different market forces may be at work. The selling market appears to be based on general economic conditions and how much was paid for the property. The purchase market also appears to be based on general economic conditions, with a special recognition of location factors. However, little is known of how much these location factors are masked in the purchase price when selling price is the dependent variable.

Nebraska

Analysis of the Nebraska data followed the same procedures as were used for the Oklahoma data. Even though the Nebraska data reflected only 45 State land purchases and 24 State land sales, it is felt that the data were sufficient for meaningful regression analysis.

Four new variables were added because of data availability. The new variables indicate the percentage of each land parcel in water, forest, pasture, and crops. They were used as proxy variables for production output. This

39/ Of the 139 parcels of land purchased, only 9 were less than 5 miles from an existing lake.

breakdown of acreage by parcel was available only for parcels sold through the State revolving fund. Similar data were not available for when the parcels were purchased by the State. A complete listing of the Nebraska variables used in one or more regressions is shown in appendix table 2.

The best predictive regression equation for Nebraska when selling price was used as the dependent variable was achieved when selling price was deflated and in log form. The following equation was obtained:

$$\text{Log } P_s = \underset{(2.28)}{-5.214^{**}} + \underset{(.001)}{.005X_3^{***}} + \underset{(.026)}{.069X_{14}^{**}} + \underset{(.0003)}{.0009X_{17}^{**}} + \underset{(.0002)}{.0005X_{20}^{**}}$$ 40/ 41/

where log P_s is selling price per acre logged; X_3 is the percentage of land in pasture; X_{14} is year sold; X_{17} is deflated purchase price; and X_{20} is deflated income in year sold. This equation has an R^2 value of .572. The percentage of pasture explained 19 percent of the variation in deflated selling price logged, the year sold explained 15.5 percent, the deflated purchase price explained 13.2 percent, and deflated income in year sold explained 9.5 percent. None of the other variables, such as size or distance indicators, were significant in explaining the deflated selling price logged.

The signs of the beta coefficients are positive and logical. The positive relationship between selling price and the percentage of pastureland indicates that as the amount of pasture increases, the sale price increases. This indicates that the most feasible and important use of project site lands in the estimation of buyers was for grazing purposes. Since the land was held by the State for about 5 years and little cropping activity took place during this time, the initial prime use of the land was for pasture. 42/

The positive relationship between selling and purchase price would indicate (1) a desire on the part of the State to avoid losing money on the land it had purchased, and/or (2) the construction of watershed structures has not changed the underlying land value factors. The positive relationship between deflated selling price and the year sold indicates that either the real cost of land has been increasing through time or that the year sold variable is acting as a proxy for inflation. The positive relationship between deflated selling price and deflated income indicates the increased real selling price is dependent on real income increases through time.

Variations of purchase price as the dependent variable were also checked. The reason for regressing purchase price variables was to test if the factors which explain purchase price were different from those which explained selling price. The major difficulty with such a comparison is that the data are not completely similar. For example, the percentage of land in various uses was not available for when the State purchased the land.

When purchase price is used as the dependent variable, the deflated forms again proved to have the highest R^2 values. The following equation resulted:

40/ Variables were significant at *90%, **95%, and ***99%.
41/ Standard error of beta values in parentheses.
42/ Average length of State ownership of project lands in Nebraska was 5 years.

$$P_{pd} = -1620.69^{***} - 6.85X_{10}^{***} + 1.13X_{12}^{**} + 36.93X_{13}^{***} - .203X_{19}^{**}$$ 43/
$$\quad\quad (455.78) \quad\quad (2.50) \quad\quad (.544) \quad\quad (9.42) \quad\quad (.083)$$ 44/

where P_{pd} is deflated purchase price; X_{10} is distance to city; X_{12} is distance to lake; X_{13} is year purchased; and X_{19} is deflated income in year purchased. The R^2 value for this equation is .422. The distance to city variable is negative, which is considered to be the most logical relationship. The positive relationship between deflated purchase price and the distance in miles to an existing lake is similar to the relationship found in the Oklahoma data. This would indicate that as distance to a lake increased, purchase price increased. The large positive relationship in deflated purchase price to the year of purchase indicates an upward trend in the real purchase price of land through time and/or an inflationary trend in land values greater than the overall price index. The negative relationship between deflated purchase price and deflated per capita income appears illogical. This is probably because of the lack of observations, or the inability of the income data to accurately reflect the real economic situation.

Comparing the Nebraska selling price equations with the Nebraska purchase price equations shows no common significant variables. This indicates that the two markets may be different. However, because of the interrelationship of purchase price in explaining selling price, the markets probably are related. The low R^2 values of the Nebraska regression equations do not allow any strong predictive conclusions to be drawn.

Market Differences

The predictive regression analysis for both Oklahoma and Nebraska indicated a difference in the explanatory variables for the land market, depending on whether the State was buying or selling land. Were these differences due to the watershed program or were they due to other causes? If these differences are due to the watershed program, what was the magnitude of the watershed development impact on land values? How closely does the impact agree with the magnitude of the impact estimated by other means? In an attempt to answer these questions, it was felt that some further analysis was needed. Therefore, an overall regression analysis was performed for each State.

The overall analysis used the last transaction price per acre as the dependent variable. A dummy variable was used to indicate if watershed development had taken place on the land. The size, distance, and income variables were the same as in previous analyses. For Oklahoma the following equation resulted:

$$P_{Td} = 171.33^{***} - 69.53X_{21}^{***} - 1.76X_5 + .019X_{22}^{*} - 3.24X_4^{**} + .79X_7$$ 45/
$$\quad\quad (33.96) \quad\quad (11.93) \quad\quad (.92) \quad\quad (.01) \quad\quad (1.54) \quad\quad (.49)$$ 46/

43/ Variables were significant at *90%, **95%, and ***99%.
44/ Standard error of beta values in parentheses.
45/ Variables were significant at *90%, **95%, ***99%.
46/ Standard error of beta values in parentheses.

where P_{Td} is last transaction price deflated by the State land value index; X_{21} is the dummy variable (1 if watershed structure completed, 0 if not completed); X_5 is miles to city; X_{22} is deflated per capita income in transaction year; X_4 is miles to town; and X_7 is percentage change in county population. The R^2 value for this equation was .368.

The dummy variable was the most important variable in explaining the last transaction price. This variable explained over 27 percent of the total variation in land value. The coefficient of this variable was negative, which indicates that when watershed development had taken place, on-site real land values were depressed. The value of the beta coefficient indicates that if the land had been used for a watershed structure, its value was decreased $69.53 per acre.

A last transaction price of $184.16 can be calculated using the mean value for the income, distance, and population change variables shown above. This indicates that the mean value of the last transaction price was decreased approximately 37.75 percent by watershed construction.

This is a larger negative estimate than was made earlier in the study by means of the hypothetical price technique (table 4). The previous estimate of $47.04 amounted to 27.5 percent of the average hypothetical price. However, given the standard error of the beta coefficients and the wide range in the average annual hypothetical price, these estimates seem quite comparable. Logically, the negative regression estimate of the dummy variable should be larger since it nets out the positive influences of income and population pressures, while at the same time it should be smaller since it also nets out the negative influences of distance. In general, the overall influence of the income, population, and distance variables is positive. 47/

The negative beta coefficients for the two distance variables indicate that as distance from either a town or a city increases, land values are decreased. This is considered to be the normal relationship. The positive relationship between deflated personal income and the percentage change in county population with deflated land values are as expected.

The significant variables of this regression equation indicate that in the overall land market examined, watershed construction activity, distance from towns and cities, population changes, and real per capita income changes were the most significant. Even though the predictive ability of this equation is not large, the analysis provides evidence that watershed construction activity does impact on-site land values and that the impact amounts to about $70 per acre.

The negative impact shown here can also be used as an estimate of what the real easement or land right costs should be. This estimate indicates that easement payments should not exceed 38 percent of actual land values. Since this estimate is higher than the estimate made earlier, the compensation needed to leave landowners in the same financial position would also have to be

47/ Verified by using the mean value of the variable in the regression equation.

larger. However, even with a payment as estimated here, indications are that actual easement payments are currently in excess of what is needed.

A similar regression analysis for Nebraska was not able to generate a reliable equation or to discover any meaningful relationship. This indicates that the purchase and selling markets in Nebraska were different and that watershed construction activity had no impact on Nebraska on-site land values. However, a more feasible explanation is that the model was unable to pick up the difference because of the lack of observations, the short time span during which the State has been active in the land market, and the large price variation between individual transactions.

FINDINGS AND CONCLUSIONS

The overall results of this study are that land value changes due to the Small Watershed Program range from an increase of 25 percent to a decrease of 38 percent, depending on locational, climatic, economic, and land use differences. Even though regression analysis only partially highlights these factors, the importance of these factors to local land market participants needs to be recognized.

The land values and land value changes estimated by the realtors and land appraisers interviewed tended to be higher and more general than those estimated with actual purchase and sale data. However, because of the realtors' knowledge of local conditions and the factors influencing the land market, their estimates should not be dismissed.

In general, the local realtors and appraisers indicated that the Small Watershed Program has had a very modest enhancing effect on structure site land values. Their estimates of land-value increases were below 10 percent of current land values. Because of the difficulty in accurately estimating the value of any property unless its characteristics are known, most realtors felt that any general estimates need to be qualified and amended by local conditions. Locational, climatic, economic, and land use differences were considered to be of major importance.

Climatological differences were considered important because low precipitation and western water laws combine to minimize the land value enhancing effects at structure sites. Dry structures provide no aesthetic improvement and reduce the visibility of the program in the more limited rainfall areas of Nebraska, Kansas, Oklahoma, and Texas, and the plains area of Colorado. The impact of watershed structures was estimated to be greater and more readily recognized in the higher precipitation areas of eastern Nebraska, Kansas, Oklahoma, and Texas, primarily because structures in these areas are usually designed and built to hold water on a permanent basis.

Locational differences were considered to be important because land value enhancement depended on access to the structure site as well as the ability to get from the property to other destinations with a minimum of difficulty. The kind and condition of roads and the distance to towns, cities, or urban areas were considered important. Somewhat related to location was the pattern of ownership. Project sites where ownership was divided between several

individuals were considered much less desirable. Multiple ownership of reservoir sites was felt to frequently result in conflict because access to the reservoir was much more difficult to control.

Changes in economic conditions at the national, State, and local level were considered to affect all land values. The recent strong inflationary trend has increased all prices, but has been particularly influential on land values and has promoted a considerable amount of speculative activity.

Land use differences create wide variations in land values. Urban, agricultural, mining, recreation, aesthetic, private, and public uses all influence land prices. Current as well as potential land use was considered important. The use of structure sites, especially in Texas and Oklahoma, for private fishing and hunting clubs and weekend hideaways was considered to be significant in enhancing land values around the reservoirs.

Estimates of the effect of small watershed development on structure site land values from Oklahoma and Nebraska revolving fund data presented a mixed picture. (However, because State revolving funds are limited and their use restricted, estimates made from these data are considered to be conservative.) Undeflated data indicated that watershed projects slightly increased the land values. The Oklahoma revolving fund showed a gain of approximately $3.00 per acre, or 2.7 percent, on land used for watershed construction during the 1956-1976 period. The Nebraska fund showed a gain of $61.00 per acre, or 24.2 percent, on watershed structure site land during the 10 years of operation (1966-1976). These undeflated land value changes correspond well with the more general estimate made by realtors and land appraisers. Deflated data generally indicated a depressing effect on land values due to watershed structures. Comparison of the hypothetical prices with actual sale prices indicated that the Oklahoma fund lost $47.00 per acre, or 27.5 percent, and the Nebraska fund lost $93.00 per acre, or 22.7 percent.

Regression analysis for Oklahoma, in which a deflated last transaction price was projected, indicated that the impact on land value due to watershed structures was a negative $69.53. This is approximately a 37.75-percent decrease in the mean per acre price.

Depending upon the use of actual, deflated, or hypothetical data, estimates of the impact of small watershed development on structure site land values range from an enhancement of 24.2 percent to a negative impact of 37.75 percent.

This study also uses the before and after sale data from Oklahoma and Nebraska to estimate what the real cost of land easements for watershed development ought to be. The data indicate that in order to leave the landowner in the same pecuniary position before and after taking his land rights, easements should not be valued at more than 25 to 38 percent of average land values. If one accepts this estimate as the maximum value of an easement, one is forced to conclude that most projects have overvalued easements. Examination of available data from Nebraska shows that easement costs have averaged approximately 55 percent of land purchase costs during a 9-year period (1967-75). Estimates made by knowledgeable people in Colorado, Kansas, Oklahoma, and Texas indicate

that easement costs for small watershed development frequently range from 75 to 90 percent of fee simple land values. Therefore, it would appear that small watershed easement costs tend to exceed the compensation necessary to leave landowners in the same financial position before and after the transfer of land rights.

Regression analysis was used to determine which factors were important in explaining land values and what impact the Small Watershed Program had on these factors. Analysis indicated that the selling market in both Oklahoma and Nebraska is based upon the original purchase price, per capita income, and either the year purchased or sold. The purchase market gives special attention to locational factors such as distance to city, town, and lake in addition to per capita income.

The predictive equations for Oklahoma generally had one dominant independent variable and had higher R^2 values than the Nebraska equations. The Nebraska equations did not have any one dominant independent variable.

Initial comparison of the selling and purchase markets tended to indicate that different market forces other than watershed construction may have been at work. However, because of the interrelationship of the purchase price in explaining selling price and because little was known as to how the locational factors were masked in the purchase price, further analysis was done.

An overall regression analysis for Oklahoma indicated that the most significant factor was watershed construction. This analysis showed that watershed construction decreased per acre land values $69.53, or by approximately 38 percent of the mean value of the last transaction price. A similar analysis of the Nebraska data was not able to generate a reliable equation or to discover any meaningful relationship.

Land rent theory presumes that in order for land to have value, there must exist some income or benefit stream and that this income or benefit stream provides the basis for land value. Therefore, in order for structure sites to have a value of even 60 to 75 percent of other land values, there must exist some stream of income or benefits that provides the basis for this value. Either watershed impoundments have little impact on agricultural production or the structure sites provide some other benefits such as aesthetics or recreation in order for the land to maintain its value.

With evidence of limited structure site land value declines and an overvaluation of easements, it would appear that some Public Law 566 evaluation policies or procedures need to be carefully examined and possibly revised. The requirement that easement costs reflect all costs of land rights acquired without any adjustment for offsetting benefits may need to be modified or there may need to be a greater recognition of structure site benefits. Hopefully, the multiobjective evaluation procedures will recognize the influence of structure sites on land values and on the value of easements.

Appendix table 1--Oklahoma regression variables

Variables	
X_1	Selling price per acre (dollars)
X_2	Purchase price per acre (dollars)
X_3	Parcel size (acres)
X_4	Distance to town 1/ (miles)
X_5	Distance to city 2/ (miles)
X_6	Distance to urban center 3/ (miles)
X_7	Percentage change in county population 4/ (entered as a whole number)
X_9	Distance to lake (miles)
X_{10}	Year sold (last two digits)
X_{11}	Income year sold (per capita personal income)
X_{12}	Year purchased (last two digits)
X_{13}	Residuals (after purchase price)
X_{14}	Income in year bought (per capita personal income)
X_{15}	Deflated purchase price per acre 5/
X_{16}	Deflated selling price per acre 5/
X_{17}	Deflated income in year bought (per capita personal income) 5/
X_{18}	Deflated income in year sold (per capita personal income) 5/
X_{19}	Deflated selling price per acre (logged) 5/
X_{20}	Selling price per acre (logged)
X_{21}	Dummy variable (1 if sold by State, project completed; 0 if still owned by State, project incomplete)
X_{22}	Deflated income in year of last transaction (per capita personal income) 5/
X_{23}	Year of last transaction (last two digits)
X_{24}	Net farm income per acre in year prior to last transaction (dollars)
X_{25}	Last transaction price deflated (dollars) 6/
X_{26}	Last transaction price (dollars)
X_{27}	Income in year of last transaction (per capita personal income)

1/ Town is defined as population $\geq$ 100 $<$1,000.
2/ City is defined as population $\geq$ 1,000 $<$25,000.
3/ Urban center is defined as population $\geq$25,000.
4/ Percentage change is based on 1960, 1970 Census of Population.
5/ Deflated to 1967 base using consumer price index.
6/ Deflated by State land value index.

Appendix table 2--Nebraska regression variables

Variables	
X_1	Percent of land in water (percent as a whole number)
X_2	Percent of land in forest (percent as a whole number)
X_3	Percent of land in pasture (percent as a whole number)
X_4	Percent of land in crops (percent as a whole number)
X_5	Selling price per acre (dollars)
X_6	Purchase price per acre (dollars)
X_7	Income in year bought (per capita personal income)
X_8	Parcel size (acres)
X_9	Distance to town 1/ (miles)
X_{10}	Distance to city 2/ (miles)
X_{11}	Distance to urban center 3/ (miles)
X_{12}	Distance to existing major lake (miles)
X_{13}	Year bought (last two digits)
X_{14}	Year sold (last two digits)
X_{15}	Income in year sold (per capita personal income)
X_{16}	Percentage change in county population 4/
X_{17}	Deflated purchase price per acre (dollars) 5/
X_{18}	Deflated selling price per acre (dollars) 5/
X_{19}	Deflated income in year bought (per capita personal income) 5/
X_{20}	Deflated income in year sold (per capita personal income) 5/
X_{21}	Deflated selling price per acre (logged) 5/
X_{22}	Selling price per acre (logged) 5/
X_{23}	Deflated last transaction price (dollars) 6/
X_{24}	Dummy variable (same as in Oklahoma regression).
X_{25}	Deflated income in year of last transaction (dollars)
X_{26}	Year of last transaction (last two digits)
X_{27}	Net farm income per acre in year prior to last transaction (dollars)
X_{28}	Income in year of last transaction (per capita personal income)
X_{29}	Last transaction price (dollars)

1/ Town is defined as population $\geq$ 100 < 1,000.
2/ City is defined as population $\geq$ 1,000 < 25,000.
3/ Urban center is defined as population $\geq$ 25,000.
4/ Percentage change is based on 1960, 1970 Census of Population.
5/ Deflated to 1967 base using consumer price index.
6/ Deflated by State land value index.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1978 261-296/81